The first and perhaps the most important part of the program is the home energy and food audit. Each member will be interviewed by a trained staff person to determine living pattern and financial status, evaluate space heating and domestic hot water, inspect and analyze the residence from basement to attic, and appraise general site conditions and potential for alternative energy production and intensive small-scale agriculture.

The audit will give detailed information on present energy use and the economics of energy and food-related home improvements. It will estimate the cost, first-year savings, payback, and rate of return for each applicable energy conservation, renewable resource, or food-production step. Each suggested strategy will be presented within the context of available financing.

The audit will provide the basis for a member's personal plan to improve the operating efficiency of his or her home and to begin to develop a home energy and food-production system.

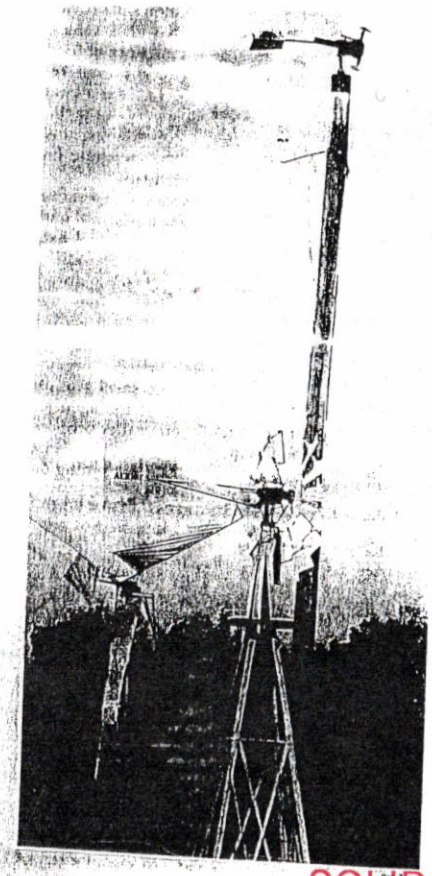
The plan will identify a range of possibilities based upon cost-effectiveness and potential payback. Products and materials including solar glazings, wood stoves and stove pipe, solar water heaters, seeds, garden tools, compost starters, and so forth, will be available through the co-op at reduced prices. The co-op will offer training and instruction to members interested in their own home food and energy projects or will arrange for construction at preferential rates by contractors experienced in appropriate technologies.

The co-op expects to be of service to about two thousand Cape and Islands residents. Membership will be open, although special emphasis will be placed on recruiting low-income families. The membership will be encouraged to interact and cooperate in part through community networks that the co-op will assist in facilitating. Establishing a community network is critical to the success of the co-op, as we realize that many of the skills and resources needed to effect a shift to self-reliance exist already in our neighborhoods and communities.

Whereas the community network might appear the least tangible of the co-op's goals, it is critical in that it speaks to and demonstrates those values that must complement our technologies whether we are aware of it or not.

Initially, New Alchemy's role will be to train future co-op staff in specific technical areas. We are beginning an apprenticeship program for co-op trainees in which they will: (1) gain skills and knowledge in intensive agriculture, aquaculture, tree crops, solar, wind, and energy conservation by working with us for a full year; and (2) simultaneously assist local residents who require help in their particular interest areas. Thus, we shall be developing a professional staff who possess useful skills and are available to apply their knowledge to residential situations. New Alchemy will be conducting the initial food and fuel audits offering a comprehensive yearlong program of seminars.

We are very excited about the co-op. In our minds it is a logical outgrowth of nearly eleven years of work and the beginning of a valued and hoped for partnership. The new cooperative will enable us to continue our research efforts while providing technical assistance to those who need it now.



Land and Its Use

Thumbing through back issues of the journal, starting with the fifth, a trend becomes apparent. It was in the fifth journal that Earle Barnhart first wrote of his interest in tree crops in the article entitled "On the Feasibility of a Permanent Agricultural Landscape." Earle wrote it just before he became acquainted with the work of Bill Mollison of Australia. He had submitted it to me when, just prior to its publication, he appeared one day looking a bit disconcerted and announced that he had just discovered a book that he felt, in his words, "completely eclipsed" his own piece. We were both in something of a quandary. We finally decided that the best we could do at the eleventh hour was to have Earle write a book review of Mollison's Permaculture One that we would include as well. Since then Earle has published a second article, "Tree Crops," and Permaculture Two by Mollison has appeared. Bill Mollison is rapidly gaining a deserved reputation as a world leader in the field. Our own tree crops program under Earle and John Quinney also progresses satisfactorily.

The idea of tree crops is gaining strength rapidly these days. There are many reasons for this; the most obvious being the need to find forms of agriculture less dependent on fossil fuel than is the present norm. A more subtle reason is the slowly dawning realization that ecosystems might have something to teach us. In most of New England, for example, neglect a piece of cleared land for a while, it becomes evident that trees are what are intended to grow there. Gives one pause. At least it gave Earle sufficient pause to begin thinking about and then to begin planting trees. This has resulted in a recorded progression from theory to practice, from writing about the idea of tree culture to writing about our trees. The "Report From the Tree People" describes the work that each of the people involved in our tree research has done, reflecting the fact that permaculture has become an important part of New Alchemy's agriculture.

Our emphasis on gardening is by no means less for our newer interest in trees. Journal readers will have become familiar with Susan Ervin's report on her experiments with mulching, biological pest control, and irrigating with pond water. With this issue she is instituting a regular feature that she has called "Garden Notes." In it she still plans to record the results of scientific experiments and in addition some more casual observations based on her seven years of gardening experience.

N.J.T.

Society's "back-door" discovery of the divine law of interrelatedness (bury enough chemical wastes in the earth, and sure enough, they'll come back to haunt you) which is the cornerstone of ecology, has inspired a growing interest in what is generally called appropriate technology. The demand for solar collectors, solar hot water systems, windmills, organically grown foods, and so forth, has increased dramatically within recent years, as has the demand for technical assistance and guidance in implementing these systems.

This is the niche that our environmental consciousness-raising has helped to create: there is a need for community appropriate technologists or in Byron Kunard's words, community-based innovation. To be sure, this is a role quite different from our former one as researchers/educators. It is nonetheless one that many of New Alchemy's supporters are now asking for and expecting us to assist in filling. The time has come, they seem to be saying, for us to put our reputation (and designs) on the line.

New Alchemy's education and outreach programs have accepted this challenge by committing more of the institute's resources to addressing the food and energy needs of the Cape Cod community. During the winter of 1979, along with three other local service agencies we were contacted by the Community Action Committee (CAC) of Cape Cod and asked to take part in planning and implementing a regional food and energy assistance agency for Cape Cod—the Cape and Islands Self-Reliance Cooperative.

The Community Action Committee is the Cape's antipoverty agency. Since its formation in 1965, it has been committed to the Cape's low-income residents. It has been successful in bringing about major changes in housing and health care for the Cape's poor. This work made CAC aware of the burden of rising fuel and food costs on the elderly, unemployed, and underemployed.

Cape Cod and the islands of Martha's Vineyard and Nantucket are at the top of the Massachusetts charts in both fuel and food costs. In many cases, families with annual incomes of less than $7,700 spend up to a quarter of that for heating. Thousands of Cape residents are forced to apply for fuel assistance. Having spent twenty-five percent of their income for fuel, Cape residents face the prospect of going to supermarkets where food prices are at least six percent above the national average.

While government programs such as fuel assistance and food stamps do help many families to meet fuel and food costs, they do next to nothing to lessen the recipients' dependence on fossil fuels, agribusiness, or future assistance. In contrast, the Self-Reliance Cooperative will offer individuals and families opportunities to achieve some measure of self-sufficiency in food and energy, and along with it, some promise of hope and increased dignity.

The goal of the Cape and Islands Self-Reliance Cooperative is to combine the technological expertise and the innovations of New Alchemy, the community organizing experience of the Community Action Committee of Cape Cod, the housing and energy financial counseling of the Housing Assistance Corporation (HAC), the energy auditing and weatherization skills of the Energy Resource Group (ERG) of Martha's Vineyard, and the fishing, farming, and aquaculture expertise of the Wampanog Tribal Councils of Mashpee and Gay Head. This collective organization will provide residents of the Cape and Islands with a vehicle through which they can achieve a measure of food and energy self-reliance and reduce overall regional dependence on fossil fuels. There is a kind of magic involved here called synergy—the increased capability resulting from combining and coordinating the actions of formerly separate individuals and groups with similar goals.

For many of us the Self-Reliance Cooperative offers a unique chance to be at once practical and idealistic. Philosophical ideas such as mutual aid, cooperation, synergy, self-reliance, and nonviolent social change that were in danger of being reduced to rhetoric or clichés have taken concrete meaning in the context of the co-op.

Conceptually the co-op is intended to foster cooperation on at least two levels: between organizations and between individuals and small groups. On an organizational level, each of the agencies brings a unique set of skills. Together they propose to provide a number of direct services to members, who will pay dues on a sliding scale depending on income. These services include:

1. Home energy and agricultural audits. This means a complete assessment of each member's house or apartment in terms of energy and water conservation, alternative energy potential, and food growing capabilities.
2. Financial counseling on federal, state, and local loan or grant programs available for weatherization and alternative energy efforts.
3. Discount and wholesale purchasing privileges for conservation, alternative energy, and food production materials and equipment, including insulation, tools, seeds, solar glazings, and so forth.
4. Access to services of home improvement and weatherization contractors at reduced rates.
5. A complete workshop/education program, including on-site courses in the member's house, special forums on subjects such as food production, pest control, energy conservation, and so forth.

The Forming of the Cape and Islands Self-Reliance Cooperative

Greg Watson and Michael Greene

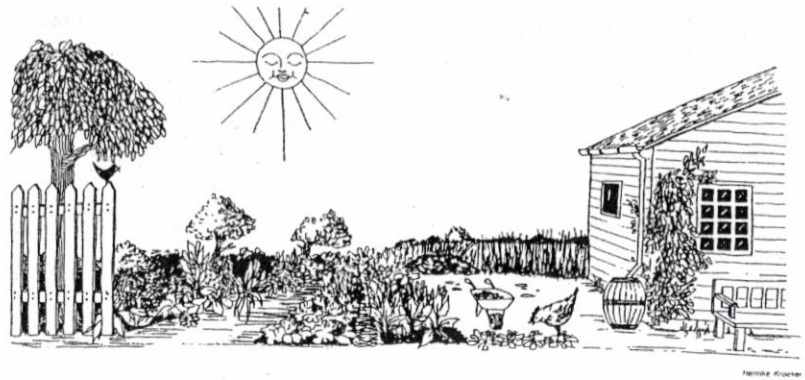
Humanity is about to discover
That whatever it needs to do
And knows how to do
It can always afford to do
And that in fact is only
And all it can afford to do
R. Buckminster Fuller

In the eleven years since the birth of New Alchemy, complex processes of societal evolution have triggered some profound shifts in the public consciousness of humanity's relationship with the natural world. Large numbers of individuals have come to realize the importance of confronting issues surrounding our personal, community, and regional patterns of food and energy production and consumption. This growing maturation of environmental awareness is honing some potential (perhaps even inevitable) new directions for New Alchemy as we enter the eighties.

For the past decade the New Alchemists have focused on designing and testing small-scale, ecologically sound food and energy-producing systems that are not dependent on fossil fuels. Early on we were primarily devoted to ascertaining the feasibility of this goal and, in turn, convincing a rather skeptical public of its practicability. Back then there was but a modicum of public interest in our work. Few people were concerned about society's ninety-five percent reliance on our "capital" energy sources. Fewer still believed that an eclectic collection of scientists, artists, and philosophers growing vegetables and raising fish in geodesic domes on Cape Cod were doing much that was even remotely relevant to their lives. Consequently, as far as most people were concerned, there was ample reason to question both the need for and the practicality of our research.

As time passed many of the dangers inherent in energy-intensive strategies that had been adopted to meet our food and energy needs were becoming all too clear. Indeed, the latter part of the seventies seemed a harbinger of doom, with marathon gas lines, water shortages, acid rain, hazardous wastes, Love Canal, and Three Mile Island—to name just a frightening few. As the seventies drew to a close we found that we didn't have to work as hard to convince people that we had little choice but to develop and implement life-support systems that recognized not only the needs of the human community but those of *Gaia*, or the natural world, as well. A most welcome turn of events.

Change, of course, brings about more change. Mutual causality plays as important a role in social process as it does in biological, ecological, and physical interaction. It was only expected that the change in public attitude to meeting energy and food needs that New Alchemy had been instrumental in creating should in turn create a new niche for us in the social fabric.



Garden Notes

Susan Ervin

Mulching

For five years we have been studying the effects of mulches on soil conditions and crop yields. Biodegradable mulches add organic material to the soil as they decompose at the same time they perform such functions generally attributed to mulch as water retention, temperature moderation, and weed control.

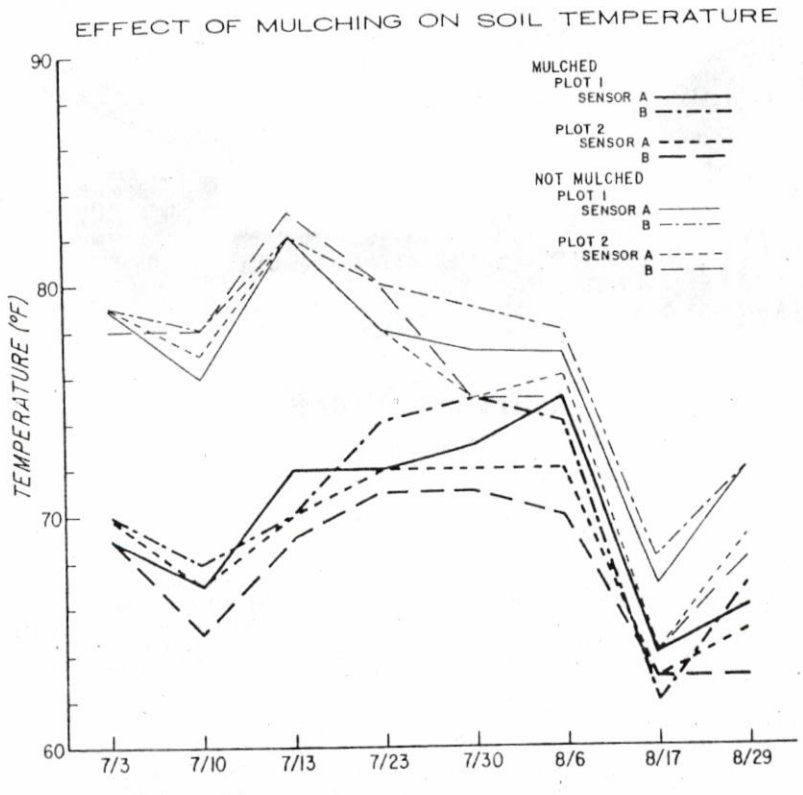
To summarize previous studies briefly: we have found that a mulch of azolla, a nitrogen-fixing aquatic fern, did not improve lettuce yields. Seaweed mulch tended to increase yields of beets, tomatoes, and Swiss chard, but resulted in decreasing yields of lettuce and peppers. Nitrate, potash, and soluble salt levels in the soil all increased under seaweed. Leaf mold was not as effective a mulch as seaweed. Supplemental watering did not significantly increase yields of either mulched or unmulched crops. Mulching reduces water runoff and the necessity of cultivation.[1]

Over the summer of 1979 we tested the effects of a straw mulch, as straw and spoiled hay are generally readily available. The plants on which the mulch was tested were Rutgers tomatoes, Salad Bowl lettuce, Early Wonder beets, and Cubannelle peppers. We divided the test field into eight lengthwise plots, four of which we mulched with a 6 inch deep layer of straw. Four were not mulched. We did supplemental watering only at seeding and transplanting time.

We took soil moisture and temperature readings at a 5 inch depth daily at 4 P.M., when temperatures tend to be highest. Two sensors were installed at each of the sites at which data were collected. We decided to use two sensors although we have observed that two sensors frequently do not agree, a perversity I found frustrating. Despite differences of opinion among sensors, however, the trends of the effect of mulch on both moisture and temperature are consistent. The temperature variation between mulched and unmulched plots is as much as 11°F., a variation similar to that under seaweed mulch. These results are summarized in the accompanying graph.

Moisture readings were similar for plots with and without mulch until mid-July (see graph) when those without mulch rapidly became drier. The unmulched areas got a better soaking during several light rains; but the mulched areas tended to retain the moisture they received longer. However, in mid-August, a heavy all-night rain saturated all plots equally, and it was the mulched plots that dried out more quickly. The seaweed mulches we

[1] Susan Ervin. 1977. The effects of mulching with seaweed and azolla on lettuce productivity. *Journal of The New Alchemists* 4: 58.
Susan Ervin. 1979. The effects of mulches. *Journal of The New Alchemists* 5: 56–61.
Susan Ervin. 1980. Further experiments on the effects of mulches on crop yields and soil conditions. *Journal of The New Alchemists* 6: 53–56.



Total lettuce yields were 1.72% higher for plots without mulch.

Total beet yields were 49.92% higher for plots with mulch, the only yield difference likely to be statistically significant.

Total tomato yields were 29.4% higher for plots with mulch.

Total pepper yields were 37.1% higher in plots without mulch.

used in previous years seemed to absorb and retain moisture better than the straw mulch.

We found no mulch-related nutrient differences under straw mulch as we had under seaweed. The straw mulch did not increase the nitrogen, potash, or soluble salt levels of the soil. Whereas nitrogen and potash increases would be beneficial, the increase in salt caused by the seaweed could be damaging to some crops, although one winter's leaching subsequently returned all areas to equally low salt levels, whether or not they had been mulched with seaweed. Nitrate levels were quite low in all plots in mid-August, but rose again by fall.

In earlier trials beet yields were as much as 225% higher, and tomatoes, 7.3% higher under the seaweed mulch. Lettuce yields, however, were 33.9% greater without seaweed mulch. The straw-mulched crops of the most recent experiment followed the tendencies of earlier years; yields were higher under mulch for beets and tomatoes, but better without mulch for lettuce and peppers.

Whereas these experiments have increased our understanding of the effects of mulches, they have also pointed up the difficulty of isolating the effects of one particular aspect of soil management on "organically" managed soils. Early in the experiments we found that supplemental watering on a weekly basis did not significantly affect yields in either mulched or unmulched areas. Some irrigated areas were, in fact, drier at times than other unirrigated ones. This could possibly be caused by a very localized sand substrate. This countered our expectation that mulch would be especially beneficial when there was a lack of water. Subsequently, neither those experimental plots with nor those without mulch have been watered except to establish plants after transplanting or to facilitate germination. Although we have a four-to-six-week period without rain each summer, crops have done well, with no evidence of needing more water. We think the water retention capability of our soil has improved because of its increased content of organic material, which is now 8%. The effects of mulch would be more pronounced on soils low in organic material. Whether organic material is on top of the soil as a mulch or mixed into the soil, it will retain water. In the future we plan to compare moisture retention in both improved and unimproved sandy soils as well as crop response to different watering schedules on these soils. It is probable that the main advantage of mulching a soil already rich in humus is in weed control and further prevention of water runoff. In areas with extreme climates, temperature moderation would be an added benefit.

Some Tactical Maneuvers for Protecting Pumpkins and Squash

Squash vine borers and cucumber beetles are serious competitors for our squash and pumpkins. Early in the season the cucumber beetles eat the leaves and can kill young plants, especially if the infestation is heavy when the plants have only their seed leaves. We plant most of the winter squash and pumpkins in peat pots in the Ark, and we have found that if we hold them there or in the cold frame until late May instead of setting them out as early as possible, there are fewer cucumber beetles and the larger plants can withstand what damage they do receive much better.

The vine borers bore into the base of the pumpkin and squash vines. We have tried slitting the stems, stabbing the ugly creatures, and rubbing rotenone in the slits. This kills the borers—and often the plants as well. We have also tried heaping dirt over the vines as they begin to run in an attempt to help them develop a second root system in case the primary stalk is destroyed. In some cases this helped. The most encouraging thing we have learned is that as our soil has improved, the loss to the borers has seemed to decline, especially in well-mulched, cool, moist areas. During the summer of 1979 the squash field, which was very fertile, had a deep mulch of leaf mold with a little straw and seaweed, and there was virtually no borer damage.

We did, however, acquire a new ailment, one we think we understand. Most of our apparently healthy pumpkins rotted from the inside and collapsed in the field. We had put a layer of fresh horsestable manure mixed with the inevitable woodchips on top of the thick leaf mulch, thinking the mulch would protect the plants from burning and allow the nutrients from the manure to leach through. The vines ran across the manure, and the fruits set on it. This probably caused some sort of bacterial disease. Perhaps after this rather disappointing experiment and the other rather more encouraging discoveries, we can look forward to a respectable harvest of squash and pumpkins with some degree of certainty.

Beans and Bean Beetles

Our bean beetle population has been much lower for several years. We don't know whether this fortunate development is due to the heavy parasitization by parasitic wasps as reported in the fifth journal, "Mexican Bean Battles," pp. 53–55, to hard winters that could kill overwintering adults, to improved soil conditions, or to a combination of events. In the summer of 1979 we put 100 parasitized beetle larvae in the bean field. Evidently the wasp hatch was low, because little subsequent parasitization occurred. Bean beetle damage was not severe. We grew two old New England varieties of beans for the first time this summer, Black Beauty and Brown Beauty. Both yielded quite well.